1195578

FINAL

April 4, 2011

PHASE IV
SAMPLING AND ANALYSIS PLAN
FOR OPERABLE UNIT 3
LIBBY ASBESTOS SUPERFUND SITE

PART B: 2011 SURFACE WATER STUDY

Prepared for, and with oversight by:

U.S. Environmental Protection Agency
Region 8
1595 Wynkoop Street
Denver, Colorado 80202

Prepared by:

SRC, Inc.
999 18th Street, Suite 1975
Denver, Colorado 80202

and

CDM
555 17th Street, Suite 1100
Denver, Colorado 80202

This page intentionally left blank to facilitate double-sided printing.

APPROVAL PAGE

Part B (2011 Surface Water Study) of the Phase IV Sampling and Analysis Plan for Operable Unit 3 of the Libby Asbestos Superfund Site is approved for implementation without conditions.

4/6/11

Christina Progess
Remedial Project Manager, Libby OU3
U.S. Environmental Protection Agency, Region 8

Date

DOCUMENT REVISION LOG

Revision	Date	Primary Changes
0	04/04/11	--

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ATTACHMENTS

LIST OF ACRONYMS

AOC	Administrative Order on Consent
CAR	Corrective Action Request
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Chain-of-Custody
DO	Dissolved Oxygen
DQO	Data Quality Objective
EDD	Electronic Data Deliverable
EDXA	Energy Dispersive X-Ray Analysis
EPA	U.S. Environmental Protection Agency
FDI	Filtered and Deionized
FS	Feasibility Study
FSDS	Field Sample Data Sheets
FSP	Field Sampling Plan
GIS	Geographic Information System
GO	Grid opening
GPS	Global Positioning System
HASP	Health and Safety Plan
HQ	Hazard Quotient
HSI	Habitat Suitability Index
ID	Identification
IL	Inter-laboratory
ISO	International Organization for Standardization
KDC	Kootenai Development Corporation
LA	Libby Amphibole
MCE	Mixed Cellulose Ester
MDEQ	Montana Department of Environmental Quality
MFL	Million fibers per liter
NVLAP	National Voluntary Laboratory Accreditation Program
OU	Operable Unit
PAH	Polycyclic Aromatic Hydrocarbon
PC	Polycarbonate
PCB	Polychlorinated Biphenyl
PDF	Portable Document Format
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RD	Recount Different
RI	Remedial Investigation
RPM	Remedial Project Manager
RS	Recount Same

LIST OF ACRONYMS (cont.)

SAED	Selective Area Electron Diffraction
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedure
SVOC	Semi-volatile Organic Compound
TEM	Transmission Electron Microscopy
TRV	Toxicity Reference Value
VA	Verified Analysis
VOC	Volatile Organic Compound

This page intentionally left blank to facilitate double-sided printing.

PHASE IV
SAMPLING AND ANALYSIS PLAN
FOR OPERABLE UNIT 3
LIBBY ASBESTOS SUPERFUND SITE

PART B: 2011 SURFACE WATER STUDY

1.0 PROJECT OVERVIEW

1.1 Purpose of this Document

This document is a Sampling and Analysis Plan (SAP) that describes data collection efforts that will be conducted during Phase IV Part B of the Remedial Investigation (RI) for Operable Unit 3 (OU3) of the Libby Asbestos Superfund Site (the site). This SAP contains the elements required for both a field sampling plan (FSP) and quality assurance project plan (QAPP), and has been developed in accordance with the U.S. Environmental Protection Agency (EPA) Requirements for Quality Assurance Project Plans (EPA 2001) and the Guidance on Systematic Planning Using the Data Quality Objectives Process – EPA QA/G4 (EPA 2006). The SAP is organized as follows:

Section 1 – Project Overview
Section 2 – Background and Problem Definition
Section 3 – Data Quality Objectives
Section 4 – Sampling Program
Section 5 – Laboratory Analysis Requirements
Section 6 – Quality Control
Section 7 – Data Management
Section 8 – Assessment and Oversight
Section 9 – Data Validation and Usability
Section 10 – References

1.2 Project Management and Organization

<u>Project Management</u>

EPA is the lead regulatory agency for Superfund activities within OU3. The EPA Remedial Project Manager (RPM) for OU3 is Christina Progess, EPA Region 8. Ms. Progess is a principal data user and decision-maker for Superfund activities within OU3.

The Montana Department of Environmental Quality (MDEQ) is the support regulatory agency for Superfund activities within OU3. The MDEQ Project Manager for OU3 is Dick Sloan. EPA will consult with MDEQ as provided for by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the National Contingency Plan, and applicable guidance in conducting Superfund activities within OU3.

EPA has entered into an Administrative Order on Consent (AOC) with Respondents W.R. Grace & Co.-Conn. and Kootenai Development Corporation (KDC) for performance of a Remedial Investigation/Feasibility Study (RI/FS) at OU3 of the Libby Asbestos Site. Under the terms of the AOC, W.R. Grace & Co.-Conn. and KDC will implement this SAP. The designated Project Coordinator for Respondents W.R. Grace & Co.-Conn. and KDC is Robert Medler of Remedium Group, Inc.

Technical Support

EPA will be supported in this Phase IV Part B investigation by a number of contractors, including:

- SRC, Inc. and CDM will assist in the development of SAPs, and in the evaluation and interpretation of the data.
- Formation Environmental, Inc., a contractor to SRC, will provide support in planning sampling and analysis activities, preparation of maps and other geographic information system (GIS) applications needed to summarize and interpret data, maintenance of a web site with site data, and evaluation of the feasibility study.
- HDR will provide oversight of field sampling and data collection activities.
- The U.S. Department of Transportation, John A. Volpe National Transportation Systems Center will implement the laboratory quality assurance (QA) program for OU3 and provide technical support.

Field Sampling Activities

All field sampling activities described in this SAP will be performed by W.R. Grace & Co.-Conn. and KDC, in strict accordance with the sampling plans developed by EPA. W.R. Grace & Co.-Conn. and KDC will be supported in this field work by Golder Associates (Golder), MWH Americas, Inc. (MWH), and by their subcontractor Chapman Construction, Inc. Individuals responsible for implementation of field sampling activities in this SAP are listed below:

Habitat Metrics:

- Golder Project Manager: Sue Robinson
- Golder Field Team Leader: Joe Volosin
- Golder Field Data Quality Control Officer: Jeremy Clark
- Golder Quality Control Officer: Douglas Morell

Surface Water Sampling:

- MWH Project Manager: John Garr
- MWH Field Team Leaders: Kaitlin Barklow/Joan Kester
- MWH Field Data Quality Control Officer: Stephanie Boehnke
- MWH Quality Control Officer: Mike DeDen

On-Site Field Coordinator

Access to the mine via Rainy Creek Road is currently restricted and is controlled by EPA. The on-site point of contact for access to the mine is Rob Burton of PRI:

Rob.burton@priworld.com
(406) 293-3690

Sample Preparation and Analysis

All samples collected as part of this investigation will be sent for preparation and/or analysis at laboratories selected and approved by EPA.

Data Management

Administration of the master database for OU3 will be performed by CDM. CDM will be responsible for sample tracking, uploading new data, performing data verification and error checks to identify incorrect, inconsistent or missing data, and ensuring that all questionable data are checked and corrected as needed. When the OU3 database has been populated, checked and validated, relevant asbestos data will be transferred into a Libby Asbestos Site database as directed by EPA for final storage.

This page intentionally left blank to facilitate double-sided printing.

2.0 BACKGROUND AND PROBLEM DEFINITION

2.1 Site Description

Libby is a community in northwestern Montana that is located near a large open-pit vermiculite mine. Vermiculite from the mine at Libby is known to be contaminated with amphibole asbestos that includes several different mineralogical classifications, including richterite and winchite, with lower frequencies of tremolite, edenite, magnesioriebikite, and magnesioarfendsonite (Meeker et al. 2003). Depending on the valence state of iron, some particles may also be classified as actinolite. For the purposes of EPA investigations at the Libby Asbestos Superfund Site, this mixture is referred to as Libby Amphibole (LA).

Historic mining, milling, and processing of vermiculite at the site are known to have caused releases of vermiculite and LA to the environment. Inhalation of LA associated with the vermiculite is known to have caused a range of adverse health effects in exposed humans, including workers at the mine and processing facilities (Amandus and Wheeler 1987, McDonald et al. 1986, McDonald et al. 2004, Sullivan 2007, Rohs et al. 2007), as well as some residents of Libby (Peipins et al. 2003). Based on these adverse effects, EPA listed the Libby Asbestos Site on the National Priorities List in October 2002.

Starting in 2000, EPA began taking a range of cleanup actions at the site to eliminate sources of LA exposure to area residents and workers using CERCLA (or Superfund) authority. Given the size and complexity of the Libby Asbestos Site, EPA designated a number of Operable Units (OUs). This document focuses on investigations at Operable Unit 3 (OU3). OU3 includes the property in and around the former vermiculite mine and the forested areas surrounding the mine that has been impacted by releases and subsequent migration of hazardous substances and/or pollutants or contaminants from the mine, including ponds, Rainy Creek, Carney Creek, Fleetwood Creek, and the Kootenai River. Rainy Creek Road is also included in OU3.

Figure 2-1 shows the location of the mine and a preliminary study area boundary for OU3. EPA established the preliminary study area boundary for the purpose of planning and developing the scope of the remedial investigation/feasibility study (RI/FS) for OU3. This study area boundary may be revised as data are obtained during the RI for OU3 on the nature and extent of environmental contamination associated with releases that may have occurred from the mine site. The final boundary of OU3 will be defined by the final EPA-approved RI/FS.

2.2 Basis for Concern at OU3

EPA is concerned with environmental contamination in OU3 because the area is used by humans for logging and a variety of recreational activities, and also because the area is habitat for a wide range of ecological receptors (both aquatic and terrestrial).

2.3 Scope and Strategy of the RI at OU3

As noted above, Respondents W.R. Grace & Co. - Conn. and KDC are performing an RI in OU3 under EPA oversight in order to characterize the nature and extent of environmental contamination and to collect data to allow EPA to evaluate risks to humans and ecological receptors from mining-related contaminants in the environment.

The RI is being performed in several phases. Phase I of the RI was performed in the fall of 2007 in accordance with the *Phase I Sampling and Analysis Plan for Operable Unit 3* (EPA 2007). The primary goal of the Phase I investigation was to obtain preliminary data on the levels and spatial distribution of asbestos and also other non-asbestos contaminants that might have been released to the environment in the past as a consequence of the mining and milling activities at the site.

Phase II of the OU3 RI was performed in the spring, summer, and fall of 2008. Phase II was composed of three parts, as follows:

- Part A (EPA 2008a) focused on the collection of data on the levels of LA and other chemicals of concern in surface water and sediment, as well as site-specific toxicity testing of surface water using rainbow trout.
- Part B (EPA 2008b) focused on the collection of data on LA levels in ambient air samples collected near the mined area, and on the collection of data on LA and other chemicals of potential concern in groundwater.
- Part C (EPA 2008c) focused on the collection of other data needed to support the ecological risk assessment at the site.

Phase III of the RI was performed in the spring, summer, and fall of 2009. The details of the plan are provided in EPA (2009). Phase III included the collection of activity-based air samples during simulated recreational visitor activities in the forested area, as well as the collection of a variety of ecological community and habitat metrics in support of the ecological risk assessment.

Phase IV of the RI is currently underway. In the summer and fall of 2010, Part A of Phase IV SAP (EPA 2010) focused on the collection of additional activity-based air samples during simulated recreational visitor, wood harvesting, forest management, and firefighting activities to support the human health risk assessment.

Part B of Phase IV (this document) focuses on the collection of additional site surface water data needed to support the ecological risk assessment. Data collection efforts will include sampling and analysis of site surface waters to characterize LA concentrations, as well as efforts to better characterize the habitat suitability of site streams for fish.

2.4 Summary of Existing Surface Water Data

As noted above, surface water samples have been collected at the site as part of the Phase I and Phase II sampling investigations. In Phase I (October 11 to October 17, 2007), one sample of surface water was collected at each of 17 surface water stations and 7 seeps (Figure 2-2). In Phase II, a much more extensive data set was collected, including multiple samples at 21 surface water stations, 7 seeps (Figure 2-3) and samples at 2 reference locations (Figure 2-4) during the time period from April 7 to October 8, 2008.

Surface water samples have been analyzed for a broad suite of analytes, including LA, metals and metalloids, petroleum hydrocarbons, anions, water quality parameters, as well as volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), nitrogen-containing compounds, and selected radionuclides.

2.5 Need for Additional Surface Water Data

Studies performed by EPA (1983a) indicate that measurement of asbestos (both chrysotile and amphibole) in water is complicated by the fact that, if the water is not completely sterile, organic matter associated with microbial contamination tends to form. This causes two effects: a) asbestos fibers in the water tend to clump together within the organic matter, leading to a decrease in structure count because most structures within clumps cannot be identified when analyzing filters using microscopy, and b) fibers within clumps of organic matter tend to adhere to the walls of the sample bottles, thus decreasing the reported concentration of asbestos in the water. The magnitude of these effects is time-variable, and depends on the amount of organic matter present and the time the sample is held before filtering. Both phenomena (fiber clumping, fiber adherence to container walls) have been observed in studies performed to date by EPA at the Libby OU3 site.

To address these issues, EPA has developed new protocols for the measurement of LA in surface water at OU3. Details on the new sample collection and analysis methods are provided in Section 4 and Section 5 of this SAP, respectively. Because surface water samples collected as part of the Phase I and Phase II sampling investigations may have been influenced by fibers clumping and adhering to sampling container walls, concentration values observed in these samples may not be accurate, and additional samples are needed to better characterize LA concentrations in surface water at the OU3 site.

In addition to surface water LA concentration data, additional data are needed on stream characteristics in OU3 to ensure that habitat factors are adequately considered in any evaluation of fish population data. Although habitat and temperature data were collected in Phase I and Phase II, additional surface water temperature data and more detailed characterization of the in-stream pools are needed to apply habitat suitability index (HSI) models for cutthroat and rainbow trout to evaluate the suitability of Rainy Creek to support and sustain fish populations (Hickman and Raleigh 1982, Raleigh et al. 1984). HSI models for salmonids use estimates or measurements of 16 different habitat variables to evaluate habitat suitability over all life stages. The temperature and pool data collected as part of this effort will fill important data gaps and allow EPA to use these models to consider fish habitat suitability and contaminant concentrations to assess the factors influencing the distribution of fish populations in OU3 creeks.

3.0 DATA QUALITY OBJECTIVES

3.1 Overview of the DQO Process

Data Quality Objectives (DQOs) define the type, quality, quantity, purpose, and intended uses of data to be collected (EPA 2006). The design of a study is closely tied to its DQOs, which serve as the basis for important decisions regarding key design features such as the number and location of samples to be collected and the analyses to be performed. In brief, the DQO process typically follows a seven-step procedure, as follows:

1. State the problem that the study is designed to address
2. Identify the decisions to be made with the data obtained
3. Identify the types of data inputs needed to make the decision
4. Define the bounds (in space and time) of the study
5. Define the decision rule which will be used to make decisions
6. Define the acceptable limits on decision errors
7. Optimize the design using information identified in Steps 1-6

Following these seven steps helps ensure that the project plan is carefully thought out and that the data collected will provide sufficient information to support the key decisions which must be made.

3.2 Data Quality Objectives for LA Concentration and Flow Monitoring

3.2.1 State the Problem

Concentrations of LA in surface water at the OU3 site may vary over time, especially in cases where there are large fluctuations in flow (e.g., during spring runoff). Data are needed to characterize the levels of LA in surface water as a function of flow, time (season), and location.

3.2.2 Identify the Decision

The decision that will be made by EPA is whether the concentration of LA in site water is sufficiently high that a response action is needed to protect fish and/or amphibian receptors from adverse effects of LA in site waters.

3.2.3 Identify the Types of Data Needed

LA Surface Water Concentration Data

One type of data that is needed to evaluate risks from LA in surface water is reliable and representative measurements of the concentration of LA in surface water as a function of both time and space. This type of data is valuable both to support risk evaluations as well as to identify sources of contaminant releases.

As noted above, previous studies performed by EPA indicate that measurement of asbestos in water is complicated by the fact that, if the water is not completely sterile, organic matter associated with microbial contamination tends to form, causing asbestos fibers in the water to clump together within the organic matter and to adhere to the walls of the sample bottles. As a consequence, LA fibers in surface water may be present as “free fibers” (i.e., not associated with organic matter) or as “fiber clumps” (in the water or adhered to the container walls). Because it is not known at this time what fiber form may be important for evaluating exposures to aquatic receptors, concentrations of LA in surface water are needed based on both free fibers and total fibers (i.e., free fibers + fiber clumps).

LA Toxicity Data

Data on LA concentration in site waters will be evaluated by comparison to site-specific exposure response data. The collection of these toxicity data is being performed as part of the Phase III investigation, and is not discussed here.

Flow and Loading Data

If it is determined that releases of LA from the site pose an unacceptable risk to ecological receptors, then EPA will need to identify the sources of those unacceptable releases in order to evaluate remedial alternatives. One of the most useful types of information for evaluating the relative significance of water-borne releases is loading (the amount of contaminant carried in water per unit time). Loading is calculated as the product of concentration and flow. Thus, data on surface water flow rates are needed to characterize the temporal variations in stream loading.

3.2.4 Define the Bounds of the Study

Spatial Bounds

The primary focus of this investigation is the Rainy Creek watershed, which includes Rainy Creek, Fleetwood Creek, and Carney Creek, as well as ponds and impoundments on these streams.

Temporal Bounds

Because surface water flow conditions are variable over time, this investigation will be conducted during a typical range of annual flow conditions. The investigation will begin as close as feasible to the start of the rising hydrograph, and will continue through the high flow period and extend into the summer and fall. The purpose of this temporal sampling pattern is to characterize, at least within the year 2011, the pattern of temporal variability in concentration levels of LA.

3.2.5 Define the Decision Rule

For aquatic receptors, risk characterization will, to the extent that data allow, be based on a weight-of-evidence approach that utilizes both of the following strategies:

- Calculation of hazard quotient (HQ) values based on comparisons of measured LA concentration in site waters to appropriate site-specific toxicity reference values (TRVs) for LA
- Direct surveys of receptor density and diversity in site streams in comparison to appropriate reference streams in the same area

The decision rule will likely take the form that, if the weight-of-evidence indicates that adverse effects on ecological receptors are occurring, and that these effects are likely to result in a meaningful decrease in the density and/or diversity of the population compared to what would be expected in the absence of site-related contamination, then an appropriate response action will be taken.

3.2.6 Define the Acceptable Limits on Decision Errors

Two types of decision errors are possible when making risk management decisions:

- A false negative decision error occurs when it is decided that risk is acceptable when the true risk is actually above the level of concern

- A false positive decision error occurs when it is decided that risk is not acceptable when the true risk is actually below the level of concern

Of these two types of errors, EPA is primarily concerned with avoiding false negative errors, because an error of this type can leave ecological receptors exposed to unacceptable levels of contamination and risk. A false positive decision error does not leave ecological receptors at risk, but is also of concern to EPA because this type of error may result in the expenditure of resources (time, money) that might be better invested elsewhere.

Because the ecological risk management decision will be based on multiple lines of evidence, utilizing data from multiple locations and multiple points of time, it is not possible to specify a quantitative or statistical approach for limiting decision errors within specified bounds. However, this limitation is largely mitigated by the weight of evidence approach itself. If multiple lines of evidence all suggest the same conclusion, then the likelihood of a decision error is low. If the multiple lines of evidence are inconsistent, then confidence in decision-making will tend to decrease.

3.2.7 Optimize the Design

In order to provide reliable data on the potential risks from site waters to aquatic receptors, data are needed from multiple locations over multiple times. To this end, the sampling design should include surface water samples from multiple locations and from multiple time points. This should include several stations along lower Rainy Creek (the area of chief concern for fish toxicity) and from site ponds (areas of chief concern for amphibian receptors).

3.3 Data Quality Objectives for Stream Habitat Characterization

3.3.1 State the Problem

In small streams, the summertime high temperature in water is an important factor in determining habitat suitability for fish. Access to deeper pools, where water is cooler, is critical for fish to escape excess heat in the summer, and also to prevent freezing in the winter. Although some data have been collected on temperatures and the occurrence of pools in site streams, the available data are not sufficiently detailed with respect to the type and extent of pools or of the temperatures that occur in summer. Data on these parameters are important in the application of fish habitat suitability index (HSI) models (Hickman and Raleigh 1982; Raleigh et al. 1984). More detailed data on pools and water temperature collected as part of this effort will fill important data gaps and allow EPA to use these models to consider fish habitat suitability in determining the factors influencing the distribution of fish populations at OU3.

3.3.2 Identify the Decision

The decision to be made is whether differences in observed fish populations in Rainy Creek compared to reference locations are attributable to LA exposures or to habitat factors. This information, in turn, will assist EPA in determining if a response action is needed to protect aquatic species from adverse effects of site-related releases of LA.

3.3.3 Identify the Types of Data Needed

Data are needed on the percentage of each stream reach that contains pools, as well as the characteristics of those pools (width, depth, cover, temperature). Collected data will provide information for HSI model variables V_1 (average maximum water temperature) and V_{15} (pool class rating).

3.3.4 Define the Bounds of the Study

Spatial Bounds

The locations where detailed stream habitat data are needed are the nine reaches where fish and benthic macroinvertebrate community surveys have previously been completed. Table 3-1 summarizes the reaches that were sampled during the 2008 and 2009 sampling efforts. As shown, this table provides the GPS coordinates for the top and bottom of the sampling reach at each location to ensure that the reaches evaluated for stream habitat parameters will be comparable to the reaches sampled for community metrics in 2008 and 2009. Because fish and benthic invertebrates are mobile, the habitat assessment reaches may be extended 10 meters in each direction.

Temporal Bounds

Percent pools and pool classes should be evaluated and recorded once during the late summer, when water flow tends to be low and water temperatures tend to be high. The target date for pool characterization is approximately mid-September.

In order to ensure that the maximum pool temperature is captured, regular measurements of pool temperature should be made during the warmest portion of the year (i.e., summer months). This will be best accomplished through the use of a temperature data logger. While temporal patterns of pool temperature fluctuation are not known, it is anticipated that hourly monitoring in the deepest portion of the pool will be sufficient to ensure that the maximum pool temperature is captured. Temperature data are not needed for every pool in each reach, provided that the pools sampled are representative of the available habitat within the reach. At a minimum, the deepest pool within each reach should be sampled.

3.3.5 Define the Decision Rule

As noted above, risk management decisions at the site will be, to the extent possible, based on a weight of evidence approach. The decision rule will likely take the form that, if there are significant differences in fish populations in site waters compared to appropriate reference reaches, those differences cannot be reasonably explained in terms of differences in available habitat, and available toxicity data suggest that the differences are likely to be attributable to LA in site waters, then an appropriate response action will be taken.

3.3.6 Define the Acceptable Limits on Decision Errors

Because the ecological risk management decision will be based on multiple lines of evidence, utilizing data from multiple locations and multiple points of time, it is not possible to specify a quantitative or statistical approach for limiting decision errors within specified bounds.

However, this limitation is largely mitigated by the weight of evidence approach itself. If multiple lines of evidence suggest the same conclusion, then the likelihood of a decision error is low. If the multiple lines of evidence are inconsistent, then confidence in decision-making will tend to decrease.

3.3.7 Optimize the Design

Study design considerations needed to optimize the study are provided in Section 4.

4.0 SAMPLING PROGRAM

All water sampling and other data collection activities within OU3 described in this SAP will be performed by personnel who are properly trained in the field methods summarized in the OU3 Standard Operating Procedures (SOPs) provided in Attachment A and the experimental sampling design details presented below. The field sampling teams will follow procedures in the Health and Safety Plan (HASP) prepared by MWH for the OU3 investigation.

Table 4-1 provides an overview of the number of data collection activities that will be performed under Phase IV Part B of the OU3 RI. The following sections present the experimental design, including sampling details and rationale, for the Phase IV Part B surface water investigation.

4.1 Study Design

This section describes the study design for Phase IV Part B data collection activities developed to meet data needs for surface water within the Rainy Creek watershed.

4.1.1 Concentration and Flow Monitoring

The purpose of this sampling effort is to monitor stream flow and LA concentrations in surface water at selected stations within the Rainy Creek watershed during the rising and falling limbs of the spring-season snowmelt-runoff hydrograph and through the summer and fall. These data will be used as part of the data set to evaluate potential exposures to ecological receptors from LA, as well as to track changes in the LA loading and transport in surface water as stream flows first rise in response to snowmelt runoff and then decline as snowmelt ends.

Surface water samples will be collected weekly beginning in mid-April 2011 (prior to the onset of rising stream flows in response to snowmelt), with weekly sampling continuing through the end of the spring high-flow period. After spring flows have decreased, then sampling every other week will occur, ending in the fall (end of September 2011).

As part of the Phase IV Part B sampling program, samples of surface water will be collected at stations LRC-2, LRC-6, CC-2, and TP (see Figure 2-3). These stations were selected because Lower Rainy Creek is the chief reach of concern for fish, and these stations are downstream of potential primary sources of asbestos, including the tailings disposal area (LRC-2), sediments deposited along lower Rainy Creek (LRC-6), and site seeps and ponds (CC-2). In addition, permanent flumes were installed in the stream channels in 2008 at these three stations; thus, continuous flow monitoring can also be performed at these stations. Station TP (in the tailings impoundment) was selected because it is representative of waters to which amphibians may be exposed.

4.1.2 Percent Pools and Pool Classes

Percent pools and pool classes will be evaluated and recorded once during the late summer when flows are low (i.e., approximately mid-September). The same nine reaches sampled for fish and benthic macroinvertebrates in 2008 and 2009 (see Table 3-1) will be evaluated, including:

- BTT-R1
- NSY-R1
- URC-1A
- URC-2
- TP-TOE2
- LRC-1
- LRC-2
- LRC-3
- LRC-5

As noted previously, to ensure that all pools which may provide viable habitat for fish within a sampling reach are characterized as part of the habitat assessment, approximately 10 meters will be added to the top and bottom of each stream reach identified in Table 3-1.

4.1.3 Pool Temperature Monitoring

For each of the nine reaches above, a temperature sensor equipped with a data logger will be placed in each pool selected for monitoring. As noted previously, pools selected for monitoring should be representative of the available habitat within the sampling reach. At a minimum, the deepest pool within each sampling reach should be selected for monitoring. The temperature probe should be placed near the bottom of the pool. Temperature should be continuously recorded at 1-hour intervals. Temperature monitoring will begin in early summer (approximately mid-June) and extend through late summer (approximately the end of September) in order to ensure that pool temperatures are monitored during the hottest part of the year.

4.2 Field Procedures

4.2.1 Surface Water Sampling Methods

Samples for Analysis of Total LA

The sampling procedures for collection of surface water grab samples to be analyzed for total LA are presented in SOP No. 3 (Rev. 0). All samples will be grab samples. For samples from Rainy Creek and Carney Creek (i.e., stations LRC-2, LRC-6 and CC-2), water samples will be collected from representative flowing water (usually the mid-channel), and sampling will occur from downstream to upstream locations to minimize the effect of sampling activities on the samples collected. For the tailings impoundment (i.e., station TP), samples will be collected from undisturbed areas near the shore. To minimize the potential effect of time variability, for each sampling round, all samples will be collected on the same day. All samples will be collected by pumping directly from the source into collection containers using a peristaltic pump.

Samples for Analysis of Free LA

Water samples for the analysis of free LA fibers will be collected at stations LRC-2, LRC-6, CC-2, and TP in accordance with the procedures described in SOP No. 3A (Rev. 0). In brief, this technique involves collecting a sample of water in a syringe, and then immediately filtering the sample through a syringe filter disk in the field. The filter cassettes are then transported to the laboratory for preparation and analysis.

The optimal volume of water filtered through the syringe filter for measurement of free LA fibers depends on the concentration in the water. If the concentration is low, the optimal volume is an amount such that the target analytical sensitivity would be achieved after counting approximately 10 grid openings:

$$V\ (mL) = EFA * 1E\text{-}03 / (GO * Ago * S)$$

For S = 0.05 MFL, EFA = 360 mm^2, and Ago = 0.013 mm^2, the optimal volume is about 50 mL.

If the concentration is high, filtration of 50 mL may result in a very high loading on the filter, and counting free fibers may be difficult. Therefore, at each station, one 50-mL filter and one 10-mL filter should be collected. The analytical laboratory will only analyze the 10-mL filter if the 50-mL filter is deemed to be overloaded.

4.2.2 Surface Water Field Measurement Methods

Whenever grab samples of surface water are collected for LA analysis (i.e., at stations LRC-2, LRC-6, CC-2, and TP), the in-stream temperature, pH, specific conductance, dissolved oxygen (DO), and turbidity will also be measured using portable field meters. Field parameter measurement and calibration protocols will be performed according to manufacturer's specifications and SOP No. 10 (Rev. 1). These measurements will be recorded on the field sampling forms.

4.2.3 Continuous Flow Monitoring Methods

Continuous flow monitoring stations have been established at three locations: CC-2, LRC-2, and LRC-6. Flow data at these three stations should be recorded using a data logger that is capable of recording water flow measurements at 1-hour intervals and storing at least one month's worth of measurements. Flow monitoring data will be collected in accordance with SOP No. 14 (Rev. 0).

4.2.4 Pool Temperature Data Collection Methods

Continuous monitoring of pool temperature will be performed using a data logger that is capable of recording temperature measurements at 1-hour intervals with an accuracy of ±0.2°C, and storing at least one month's worth of measurements. Pool temperature monitoring data will be collected in accordance with SOP No. 20 (Rev. 0). This SOP provides detailed information on how to calibrate, place, and retrieve the temperature data logger.

4.2.5 Stream Pool Classification Methods

The procedures for stream pool classification are presented in SOP No. 19 (Rev. 0). A pool is defined as a portion of a reach with reduced water velocity, water depth greater than the surrounding areas, water surface gradient at low flow often near zero and bed often concave in shape forming a depression in the lower part of the streambed (Meehan 1991).

For each reach, each identified pool is classified as a 1st, 2nd, or 3rd class pool based on the following criteria:

Pool Class	Description
1st	Large[1] and deep. Pool depth and size are sufficient to provide a low velocity resting area for several adult fish. More than 30 percent of the pool bottom is obscured due to depth, surface turbulence, or the presence of structures, for example, logs, debris, boulders, or overhanging banks and vegetation. The pool depth is $\geq$ 1.0 meters deep (in streams < 5 meters wide). Note: Rainy Creek averages < 2 meters in width.
2nd	Moderate size and depth. Pool depth and size are sufficient to provide a low velocity resting area for a few adult fish. From 5 to 30 percent of the pool bottom is obscured due to depth, surface turbulence, or structures. Typical second class pools are large eddies behind boulders and low velocity moderately deep areas beneath overhanging banks and vegetation. Pool depth may range from 0.3 meters to <1.0 meters.
3rd	Small or shallow or both. Pool depth and size are sufficient to provide a low velocity resting area for one or two adult fish. Cover, if present, is in the form of shade, surface turbulence, or very limited structure. Typical third class pools are wide, shallow pool areas of streams or small eddies behind boulders. Virtually the entire bottom area is discernable. Pool depth is <0.3 meters.

These pool class definitions are based on the definitions provided in the HSI models for rainbow trout and cutthroat trout (Hickman and Raleigh 1982; Raleigh et al. 1984, Lewis 1969). A slight

[1] Although the pool class descriptions use size descriptors of "large", "moderate", and "small", the HSI models do not specify any areal requirements for pool size.

adjustment to optimal pool depth for 1st class pools (lowering from > 1.5 meters to $\geq$ 1.0 meters) is based on Adams et al. (2008). The addition of specific pool depths to 2nd and 3rd class pools is based on Harig and Fausch (2002).

Each reach is then assigned a pool class rating of A, B, or C based on the following criteria:

A: $\geq$ 30% of the reach is comprised of 1st class pools
B: $\geq$ 10% to < 30% 1st class pools, or $\geq$ 50% 2nd class pools
C: < 10% 1st class pools and < 50% 2nd class pools

As seen, the pool class rating criteria are based on an estimate of the surface area coverage of each type of pool class relative to the surface area of the entire reach.

4.3 Sample Handling

4.3.1 Sample Containers

All grab samples of surface water collected for analysis of total LA will be placed in wide-mouth 1 liter HDPE bottles. These bottles should be held in the field in an ice chest at approximately 4 degrees C and transported to the analytical laboratory daily.

All syringe filters collected in the field for analysis of free LA should be placed in clearly labeled plastic Ziploc bags and stored in an ice chest in the field until transport to the analytical laboratory (daily).

4.3.2 Sample Archival and Final Disposition

Unused samples and containers of environmental media will be maintained in storage at the laboratory for a minimum of 90 days following completion of the analysis, unless otherwise directed by EPA. Except as noted below, after 90 days or approval from EPA for disposal, the laboratory will be responsible for proper disposal of any remaining samples, sample containers, shipping containers, and packing materials in accordance with sound environmental practice, based on the sample analytical results. The laboratory will maintain proper records of waste disposal methods, and will have disposal company contracts on file for inspection.

Unanalyzed portions of filters and grids that have been prepared for asbestos analysis shall not be disposed of but held in archive at the asbestos analytical laboratory.

All data generated during the analysis of project samples must be stored by the laboratory for a period of ten years. Revised copies of the applicable SOPs and QAPPs must also be maintained and available should the data be required.

4.4 Sample Documentation and Identification

Data regarding each sample collected will be documented in accordance with SOP No. 9 (Rev. 6) using Libby-specific field sample data sheets (FSDS). Any special circumstances that influence sample collection or result in deviations from sampling SOPs will be documented in a field log book.

At the time of collection, each sample will be labeled with a unique 5-digit sequential identification (ID) number. The sample ID for all samples collected as part of Phase IV sampling activities will have a prefix of "P4" (e.g., P4-12345). Information on whether the sample is representative of a field sample or a field-based quality control (QC) sample (e.g., field blank, field duplicate) will be documented on the FSDS, but this information will not be included on the chain-of-custody (COC) to make certain that the sample type is unknown to the analytical laboratory.

Each field sampling team will maintain a field log book. The log book shall record all potentially relevant information on sampling activities and conditions that are not otherwise captured on the FSDS forms. Examples of the type of information to be captured in the field log include:

- Names of team members
- Current and previous weather conditions
- Field sketches
- Physical description of the location relative to permanent landmarks
- Number and type of samples collected
- Any special circumstances that influenced sample collection or reliability

As necessary for sample collection and location documentation, photographs will be taken using a digital camera. Global positioning system (GPS) coordinates will be recorded in accordance with SOP No. 11 (Rev. 1) for all sampling locations on the FSDS form. A stake or pole identifying the sampling station will be placed at or near the sampling station for future identification of the location.

4.5 Sample Chain-of-Custody and Shipment

Field sample custody and documentation will follow the requirements described in SOP No. 9 (Rev. 6). Sample packaging and shipping will follow the requirements described in SOP No. 8 (Rev. 0).

A COC form specific to the OU3 investigation shall accompany every shipment of samples to the analytical laboratory. The purposes of the COC form are: a) to establish the documentation necessary to track possession from the time of collection to final disposal; and b) to identify the type of analysis requested. All corrections to the COC record will be initialed and dated by the person making the corrections. Each COC form will include signatures of the appropriate individuals indicated on the form. The originals will accompany the samples to the laboratory and copies documenting each custody change will be recorded and kept on file. One copy of the COC will be kept by field personnel.

All required paper work, including sample container labels, COC forms, custody seals and shipping forms will be fully completed in ink (or printed from a computer) prior to submittal of the samples to the analytical laboratory. All samples that may require special handling by laboratory personnel to prevent potential exposure to LA or other hazardous substances will be clearly labeled. All aqueous surface water samples will be hand delivered to the EMSL Mobile Laboratory in Libby for filter preparation.

Upon delivery of the samples to the laboratory, the samples will be given to the laboratory sample custodian, who will sign the COC to document custody transfer. The shipping containers will be opened and the contents inspected. Chain-of custody forms will be reviewed for completeness and samples will be logged and assigned a unique laboratory sample number. Any discrepancies or abnormalities in samples will be noted and the Laboratory QA Manager and the EPA RPM will be promptly notified.

Chain-of-custody will be maintained until final disposition of the samples by the laboratory and acceptance of analytical results.

This page intentionally left blank to facilitate double-sided printing.

5.0 LABORATORY ANALYSIS REQUIREMENTS

5.1 Analytical Methods for Asbestos

All laboratories that analyze samples of surface water for asbestos as part of this project must participate in and have satisfied the certification requirements in the last two proficiency examinations from the National Institute of Standards and Technology/National Voluntary Laboratory Accreditation Program (NVLAP). Laboratories must also have demonstrated proficiency by successful analysis of Libby-specific performance evaluation samples and/or standard reference materials, and must participate in the on-going laboratory training program developed by the Libby laboratory team.

All surface water samples collected during Phase IV Part B sampling will be submitted for asbestos analysis using transmission electron microscopy (TEM).

Aqueous Sample Preparation Methods for the Measurement of Total LA Fibers

Prior to filtration, all aqueous surface water samples will be treated with ozone, ultraviolet light, and sonicated in accordance with the water sample preparation methods in EPA Method 100.1, Section 6.2 (EPA 1983b). This treatment oxidizes organic matter that is present in the water or on the walls of the bottle, destroying the material that causes clumping and binding of fibers. This treatment technique provides a good estimate of total LA fibers (i.e., free fibers + fiber clumps) in the water sample.

Following treatment, an aliquot of water (generally about 50 mL) will be filtered through a 25 mm diameter polycarbonate (PC) filter with a pore size of 0.1 µm with a mixed cellulose ester (MCE) filter, 0.45 µm pore size, used as a support filter, using the technique for vacuum filtration described in EPA Method 100.1, Section 6.3. Approximately ¼ of the filter will be used to prepare a minimum of three TEM grids in accordance with the grid preparation techniques described in EPA Method 100.1.

Field-Prepared Filter Preparation Methods for the Measurement of Free LA Fibers

Surface water samples that are filtered in the field using the collection technique described in SOP No. 3A (Rev. 0) will be used to provide an estimate of free LA fibers (i.e., fibers that are not associated with organic matter present in the water). As noted in Section 4.2.1, two filters will be prepared in the field at each station, one filter will be prepared using 50 mL and one filter will be prepared using 10 mL. The 10-mL filter should only be analyzed if the 50-mL filter is overloaded. Approximately ¼ of the filter will be used to prepare a minimum of three TEM grids in accordance with the grid preparation techniques described in EPA Method 100.1.

At EPA's discretion, the analysis of the syringe filter samples for LA may be implemented in a phased fashion, with only some of the collected samples being analyzed initially. EPA will provide direction to the analytical laboratory on which samples to analyze, and in what sequence.

Counting Rules

Filters for the measurement of total LA fibers will be analyzed in accordance with the International Organization for Standardization (ISO) 10312:1995(E) method (ISO 1995) counting protocols, with all applicable Libby site-specific laboratory modifications, including the most recent versions of modifications LB-000016, LB-000019, LB-000028, LB-000029B, LB-000030, and LB-000066C (as provided in Attachment B). All amphibole structures (including not only LA but all other amphibole asbestos types as well) that have appropriate Selective Area Electron Diffraction (SAED) patterns and Energy Dispersive X-Ray Analysis (EDXA) spectra, and having length ≥ 0.5 um and an aspect ratio (length:width) ≥ 3:1, will be recorded on the most recent version of the Libby OU3 site-specific laboratory bench sheets and electronic data deliverable (EDD) spreadsheets (e.g., "Water TEM v10_OU3.xls"). Data recording for chrysotile, if observed, is not required.

Filters for the measurement of free LA fibers will be analyzed using the same counting protocols as for total LA fibers, except that only "free fibers" (i.e., fibers not associated with organic material clumps) will be counted. The analyst will note the occurrence of large organic LA-containing clumps that are observed, and report this on the site-specific laboratory bench sheet under Structure Type as "clump".

Stopping Rules

The TEM stopping rules for this project are as follows:

Count at least two grid openings from each of two grid (minimum = 4 total). Continue counting until one of the following stopping rules is achieved:

1. The target sensitivity is achieved.
2. A total of 100 countable LA structures are observed. In this case, finish counting the grid opening with the 100th structure, then stop.
3. A total of 50 grid openings are examined.

For this project, the target analytical sensitivity for asbestos in water is 50,000 f/L (0.05 million fibers per liter, abbreviated as MFL). Assuming a water volume of 50 mL (i.e., filter overloading does not occur), this target can be achieved by counting about 10 grid openings.

5.2 Instrument Calibration and Frequency

All laboratory instruments used in the analysis of samples generated during this project must be calibrated by the laboratory in accordance with the requirements of the instrument manufacturer and the requirements specified in the relevant analytical method. Calibration records will be kept in logbooks for all instruments. It is the responsibility of the Laboratory QA Officer to assure that calibration data is properly logged in the logbooks for each analysis.

5.3 Laboratory Custody Procedures and Documentation

The laboratories will implement the following procedures:

- A sample custodian will be designated.
- Upon receipt at the laboratory, each sample shipment will be inspected to assess the condition of the shipping container and the individual samples.
- Enclosed COC records will be cross-referenced with all the samples in the shipment. These records will be signed by the sample custodian and placed in the project file.
- Sample storage will be secured (in the appropriate environment, i.e., refrigerated, dry, etc.), sample storage records and intra-laboratory sample custody records will be maintained, and sample disposal and disposal date will be properly documented.
- Internal COC procedures will be followed by assigning a unique laboratory number to each sample on receipt; this number identifies the sample through all further handling;
- Internal logbooks and records will maintain the COC throughout sample preparation and analysis, and data reporting will be kept in the project files.
- The original COC record will be returned to the QA Officer with the resulting data report from the laboratory.

It is the responsibility of the QA Officer to ensure that internal logbooks and records are maintained throughout sample preparation, analysis, and data reporting.

5.4 Laboratory Health and Safety

All laboratories analyzing samples from OU3 must be properly trained in the safe handling, storage and disposal of samples that may contain LA and other potentially hazardous materials.

5.5 Documentation and Records

Data reports will be submitted to the Project Manager and include a case narrative that briefly describes the number of samples, the analyses, and any analytical difficulties or QA/QC issues associated with the submitted samples. The data report will also include signed COC forms, analytical data summary report pages, and a summary of laboratory QC sample results and raw data, where applicable. Raw data are to consist of instrument preparation and calibration logs, instrument printouts of field sample results, laboratory QC sample results, calibration and maintenance records, COC check in and tracking, raw data count sheets, spectra, micrographic photos, and diffraction patterns.

5.6 Data Deliverables

Asbestos data generated during this project will be entered into Libby-specific EDD spreadsheets by appropriately trained data entry staff. The data to be captured will include all relevant field information regarding each environmental sample collected, as well as the analytical results provided by the laboratory. Analytical results will include the structure-specific data for all TEM analyses. All data entry will be reviewed and validated for accuracy by the laboratory data entry manager or appointed delegate.

All asbestos EDDs will be submitted to EPA technical contractors (CDM) electronically. Whenever possible, data files should be transmitted by e-mail to the following address:

LibbyOU3@cdm.com

When files are too large to transmit by e-mail, they should be provided on compact disc to the following address:

CDM
Attn: Lynn Woodbury
555 17th Street, Suite 1100
Denver, CO 80202

All original data records (both hard copy and electronic) will be cataloged and stored in their original form until otherwise directed by the EPA RPM. At the termination of the project, all original data records will be provided to the EPA RPM for incorporation into the OU3 project files.

6.0 QUALITY CONTROL

Quality Control (QC) is a component of the QAPP, and consists of the collection of data that allow a quantitative evaluation of the accuracy and precision of the field data collected during the project. QC samples that will be collected during this project include both field-based and laboratory-based QC samples.

6.1 Field-Based Quality Control Samples

Field-based QC samples are those samples which are prepared in the field and submitted to the laboratory in a blind fashion. That is, the laboratory is not aware the sample is a QC sample, and should treat the sample in the same way as a field sample. There are two types of field QC sample that will be collected as part of this investigation: field blanks and field duplicates.

Field Blanks

A field blank is a sample of the same medium as field samples, but which does not contain any contaminant. A field blank for bulk water shall be prepared by placing an appropriate volume of filtered and deionized (FDI) laboratory water into a sample collection container. A field blank for syringe filter samples shall be prepared by filtering an appropriate volume of FDI water through the syringe filter under field conditions.

Field blanks for bulk water and syringe filters will be collected at a rate of at least 5% (1 field blank per 20 field samples). A bulk water field blank is prepared by placing 800 mL of FDI water in the same bottle types as used for field samples. For syringe filters, a field blank is prepared by filtering 50 mL of FDI water through the filter holder. Both types of field blank should be performed while in the field.

If one or more LA structures are observed in a field blank, a data qualifier may applied to the related field samples (i.e., field samples collected by the same team on the same day) to indicate potential contamination.

Field Duplicates

A field duplicate is a sample of the same medium collected at the same time and same place as the original field sample. Field duplicates for bulk water and syringe filter samples will be collected at a rate of at least 5% (1 field duplicate per 20 field samples).

6.2 Laboratory-Based Quality Control Samples

The QC requirements for TEM analyses of water samples at the Libby site are patterned after the requirements set forth by NVLAP. There are three types of laboratory-based QC analyses that are performed for TEM. Each of these is described in more detail below.

> *Lab Blank* - This is an analysis of a TEM grid that is prepared from a new, unused filter by the laboratory and is analyzed using the same procedure as used for field samples.
>
> *Recounts* - A recount is an analysis where TEM grid openings are re-examined after the initial examination. The type of recount depends upon who is performing the re-examination. A *Recount Same* (RS) describes a re-examination by the same microscopist who performed the initial examination. A *Recount Different* (RD) describes a re-examination by a different microscopist within the same laboratory than who performed the initial examination. A *Verified Analysis* (VA) is similar to a Recount Different but has different requirements with regard to documentation (i.e., recorded in accordance with the protocol provided in NIST 1994). An *Interlab* (IL) describes a re-examination by a different microscopist from a different laboratory.
>
> *Repreparation* - A repreparation is an analysis of a TEM grid that is prepared from a new aliquot of the same field sample as was used to prepare the original grid. Typically, this is done within the same lab as did the original analysis, but a different lab may also prepare grids from a new piece of filter.

Laboratory blanks will be performed at a frequency of 4% (1 per 25 samples) or one with each preparation batch, whichever is more frequent. Recounts will be performed at a frequency of 1% (1 per 100 samples) for Recount Same, 2.5% for Recount Different, and 1% (1 per 100 samples) for Verified Analysis. Repreparations will be performed at a frequency of 1% (1 per 100 samples). LB-000029B summarizes the project-specific acceptance criteria for TEM QC analyses for all participating laboratories.

For the purposes of the OU3 investigations, laboratory QC sample frequency requirements should be applied on a project-specific and medium-specific basis, rather than "across all media" as specified in LB-000029B. Table 6-1 presents a summary of the number of expected laboratory QC samples for TEM analysis for the Phase IV Part B sampling program.

7.0 DATA MANAGEMENT

7.1 Data Applications

All data generated as part of the Phase IV Part B sampling event will be maintained in an OU3-specific Microsoft Access® database. This will be a relational database with tables designed to store information on station location, sample collection details, preparation and analysis details, and analytical results. Results will include all asbestos data, including detailed structure attributes for TEM analyses.

7.2 Roles and Responsibilities for Data Flow

7.2.1 Field Personnel

W.R. Grace contractors will perform all Phase IV Part B sample collection in accordance with the project-specific sampling plan and SOPs presented above. In the field, sample details will be documented on hard copy media-specific FSDS forms and in field log books. COC information will be documented on hard copy forms. FSDS and COC information will be manually entered into a field-specific[2] OU3 database using electronic data entry forms. Use of electronic data entry forms ensures the accuracy of data entry and helps maintain data integrity. For example, data entry forms utilize drop-down menus and check boxes whenever possible. These features allow the data entry personnel to select from a set of standard inputs, thereby preventing duplication and transcription errors and limiting the number of available selections (e.g., media types). In addition, entry into a database allows for the incorporation of data entry checks. For example, the database will allow a unique sample ID to only be entered once, thus ensuring that duplicate records cannot be created.

Entry of FSDS forms and COC information will be completed weekly, or more frequently as conditions permit. Copies of all FSDS forms, COC forms, and field log books will be scanned and posted in portable document format (PDF) to a project-specific eRoom[3] site weekly. This eRoom will have controlled access (i.e., user name and password are required) to ensure data access is limited to appropriate project-related personnel. File names for scanned FSDS forms, COC forms, and field log books will include the sample date in the format YYYYMMDD to facilitate document organization (e.g., FSDS_20110412.pdf). Electronic copies of all digital photographs will also be posted weekly to the project-specific eRoom. File names for digital photographs will include the station identifier, the sample date, and photograph identifier (e.g., ST-1_20110412_12345.tif).

---

[2] The field-specific OU3 database is a simplified version of the master OU3 database. This simplified database includes only the station and sample recording and tracking tables, as well as the FSDS and COC data entry forms.
[3] https://team.cdm.com/eRoom/mt/LibbyOU3

After FSDS data entry is completed, a copy of the field-specific OU3 database will be posted by the field data manager to the project-specific eRoom weekly, or more frequently as conditions permit. The field-specific OU3 database posted to the eRoom site will include the post date in the file name (e.g., FieldOU3DB_20110516.mdb).

7.2.2 Laboratory Personnel

Each of the laboratories performing asbestos analyses for the Phase IV Part B sampling event are required to utilize all applicable Libby-specific Microsoft Excel® spreadsheets for asbestos data recording and electronic submittals. Upon completion of the appropriate analyses, EDDs will be transmitted via email to a designated email distribution list within the appropriate turnaround time. Hard copies of all analytical laboratory data packages will be scanned and posted as a PDF to the project-specific eRoom. File names for scanned analytical laboratory data packages will include the laboratory name and the job number to facilitate document organization (e.g., LabX_12345-A.pdf).

7.2.3 Database Administrators

Day-to-day operations of the master OU3 database will be under the control of EPA contractors. The primary database administrator (CDM) will be responsible for sample tracking, uploading new data, performing error checks, and making any necessary data corrections. New records will be added to the master OU3 database within an appropriate time period of FSDS and/or EDD receipt.

Incremental backups of the master OU3 database will be performed daily Monday through Friday, and a full backup will be performed each Saturday. The full backup tapes will be stored off-site for 30 days. After 30 days, the tape will be placed back into the tape library to be overwritten by another full backup.

7.3 Data Storage

All original data records (both hard copy and electronic) will be cataloged and stored in their original form until otherwise directed by the EPA RPM. At the termination of this project, all original data records will be provided to the EPA RPM for incorporation into the site project files.

8.0 ASSESSMENT AND OVERSIGHT

Assessments and oversight reports to management are necessary to ensure that procedures are followed as required and that deviations from procedures are documented. These reports also serve to keep management current on field activities. Assessment, oversight reports, and response actions are discussed below.

8.1 Assessments

8.1.1 Field Oversight

All individuals who collect samples during field activities will be provided a copy of this SAP and will be required to participate in a pre-sampling readiness review meeting to ensure that methods and procedures called for in this SAP and associated SOPs are understood and that all necessary equipment is on hand. EPA may perform random and unannounced field audits of field sampling collection activities, as may be deemed necessary.

8.1.2 Laboratory Oversight

All laboratories selected for analysis of samples for asbestos will be part of the Libby analytical team. These laboratories have all demonstrated experience and expertise in analysis of LA in environmental media, and all are part of an on-going site-specific quality assurance program designed to ensure accuracy and consistency between laboratories. These laboratories are audited by EPA and NVLAP on a regular basis. Additional laboratory audits may be conducted upon request from the EPA, as may be needed.

8.2 Response Actions

If any inconsistencies or errors in field or laboratory methods and procedures are identified, response actions will be implemented on a case-by-case basis to correct quality problems. All response actions will be documented in a memo to the EPA RPM for OU3 at the following address:

Christina Progess
U.S. EPA Region 8
1595 Wynkoop Street
Denver, CO 80202
Tel: (303) 312-6009
Fax: (303) 312-7151
E-mail: progess.christina@epa.gov

Any problems that cannot be corrected quickly through routine procedures may require implementation of a corrective action request (CAR) form.

8.3 Reports to Management

Field and analytical staff will promptly communicate any difficulties or problems in implementation of the SAP to EPA, and may recommend changes as needed. If any revisions to this SAP are needed, the EPA RPM will approve these revisions before implementation by field or analytical staff.

9.0 DATA VALIDATION AND USABILITY

9.1 Data Validation and Verification Requirements

Data validation, review, and verifications must be performed on sample results before distribution to the public for review.

For asbestos analytical data, data verification includes checking that all required data have been entered on the laboratory bench sheets and field sample data sheets, and that results have been transferred correctly to the EDD. Some of the data verification checks are performed as a function of built-in quality control checks in the Libby-specific data entry spreadsheets. Additional verifications of field and analytical results will be performed manually by independent review of the bench sheets and FSDS. The initial frequency of manual review will be 10% of all samples. This initial rate may be revised either upward or downward depending on the frequency and nature of errors that are identified by the verification process.

9.2 Reconciliation with Data Quality Objectives

Once all samples have been collected and the analytical data have been reported and validated, the data will be reviewed by data users to determine if DQOs were achieved.

This page intentionally left blank to facilitate double-sided printing.

10.0 REFERENCES

Adams P, James C, Speas C. 2008. Rainbow trout (Oncorhynchus mykiss) Species and Conservation Assessment. Prepared for the Grand Mesa, Uncompahgre and Gunnison National Forests.

Amandus HE, Wheeler R. 1987. The Morbidity and Mortality of Vermiculite Miners and Millers Exposed to Tremolite-Actinolite: Part II. Mortality. Am. J. Ind. Med. 11:15-26.

EPA. 1983a. Development of Improved Analytical Techniques for Determination of Asbestos in Water samples. Report prepared for the U.S. Environmental Protection Agency, Environmental Research Laboratory, Office of Research and Development, Athens, GA, by the Ontario Research Foundation, Mississauga, Ontario. EPA-600/4-83-042. September, 1983.

EPA. 1983b. Analytical Method for Determination of Asbestos in Water. U.S. Environmental Protection Agency, Environmental Research Laboratory, Office of Research and Development, Athens GA. EPA-600/4-83-043. September, 1983.

EPA. 2001. EPA Requirements for Quality Assurance Project Plans. EPA QA/R-5. U.S. Environmental Protection Agency, Office of Environmental Information. EPA/240/B-01/003. March 2001.

EPA. 2006. Guidance on Systematic Planning Using the Data Quality Objectives Process – EPA QA/G4. U.S. Environmental Protection Agency, Office of Environmental Information. EPA/240/B-06/001. February 2006.

EPA. 2007. Phase I Sampling and Analysis Plan for Operable Unit 3 Libby Asbestos Superfund Site. September 26, 2007.

EPA. 2008a. Phase II Sampling and Analysis Plan for Operable Unit 3 Libby Asbestos Superfund Site, Part A: Surface Water and Sediment. U.S. Environmental Protection Agency, Region 8. May 29, 2008.

EPA. 2008b. Phase II Sampling and Analysis Plan for Operable Unit 3 Libby Asbestos Superfund Site, Part B: Ambient Air and Groundwater. U.S. Environmental Protection Agency, Region 8. July 2008.

EPA. 2008c. Phase II Sampling and Analysis Plan for Operable Unit 3 Libby Asbestos Superfund Site, Part C: Ecological Data. U.S. Environmental Protection Agency, Region 8. September 17, 2008.

EPA. 2009. Phase III Sampling and Analysis Plan, Remedial Investigation for Operable Unit 3, Libby Asbestos Superfund Site. U.S. Environmental Protection Agency, Region 8. May 26, 2009.

EPA. 2010. Phase IV Sampling and Analysis Plan, Remedial Investigation for Operable Unit 3, Libby Asbestos Superfund Site, Part A: Data to Support Human health Risk Assessment. U.S. Environmental Protection Agency, Region 8. June 2010.

Harig A, Fausch K. 2002. Minimum habitat requirements for established translocated Cutthroat trout populations. Ecological Applications 12(2) 535-551.

Hickman T, Raleigh RF. 1982. Habitat suitability index models: Cutthroat trout. United States Fish and Wildlife Service Report FWS/OBS-82/10.5, Fort Collins, CO.

International Organization for Standardization (ISO). 1995. Ambient Air – Determination of asbestos fibres – Direct-transfer transmission electron microscopy method. ISO 10312:1995(E).

Lewis SL. 1969. Physical factors influencing fish populations in pools of a trout stream. Trans. Am. Fish. Soc. 92(2):140-145.

McDonald JC, McDonald AD, Armstrong B, Sebastien P. 1986. Cohort study of mortality of vermiculite miners exposed to tremolite. Brit. J. Ind. Med. 43:436-444.

McDonald JC, Harris J, Armstrong B. 2004. Mortality in a cohort of vermiculite miners exposed to fibrous Amphibole in Libby, Montana. Occup. Environ. Med. 61:363-366.
McDonald JC, McDonald AD, Armstrong B, Sebastien P. 1986. Cohort study of mortality of vermiculite miners exposed to tremolite. Brit. J. Ind. Med. 43:436-444.

Meehan W R (Ed.). 1991. Influence of forest and rangeland management on salmonid fish and their habitats. American Fishery Society Special Publication, Bethesda, MD.

Meeker GP, Bern AM, Brownfield IK, Lowers HA, Sutley SJ, Hoeffen TM, Vance JS. 2003. The Composition and Morphology of Amphiboles from the Rainy Creek Complex, Near Libby, Montana. American Mineralogist 88:1955-1969.

NIST (National Institute of Standards and Technology). 1994. Airborne Asbestos Method: Standard Test method for Verified Analysis of Asbestos by Transmission Electron Microscopy – Version 2.0. NIST, Washington DC. NISTIR 5351. March 1994.

Peipins LA, Lewin M, Campolucci S, Lybarger JA, Miller A, Middleton D, et al. 2003. Radiographic abnormalities and exposure to asbestos-contaminated vermiculite in the community of Libby, Montana, USA. Environ. Health Perspect. 111:1753-1759.

Raleigh RF, Hickman T, Solomon RC, Nelson PC. 1984. Habitat suitability information: Rainbow trout. United States Fish and Wildlife Service. FWS/OBS-82/10.60, Fort Collins, CO.

Rohs AM, Lockey JE, Dunning KK, Shulka R, Fan H, Hilbert T, Borton E, Wiot J, Meyer C, Shipley RT, LeMasters GK, Kapol V. 2007. Low level Fiber Induced Radiographic Changes Caused by Libby Vermiculite: A 25 year Follow-up Study. Am J Respiratory and Critical Care Medicine. Published online December 6, 2007 as doi:10.1164/rccm.200706-814OC.

Sullivan PA. 2007. Vermiculite, Respiratory Disease and Asbestos Exposure in Libby, Montana: Update of a Cohort Mortality Study. Environmental Health Perspectives doi:10.1289/ehp.9481 available online at http://dx.doi.org.

This page intentionally left blank to facilitate double-sided printing.

Table 3.1 Sampling Reach Information for Aquatic Community Sampling Locations

Location Type	Station ID	Location Descriptor	Reach Information				GPS Coordinates (UTM)			
							Top of reach		Bottom of Reach	
			Elevation (m)	Length (m)	Avg Stream Width (m)	Area (m^2)	Northing	Easting	Northing	Easting
Reference	BTT-R1	Tributary of Bobtail Creek	756	66	1.39	92	603859	5366414	603856	5366340
	NSY-R1	Noisy Creek, Tributary of Pipe Creek	1001	70	1.44	101	608381	5377826	608347	5377780
OU3	URC-1A	Upper Rainy Creek site	934	33	1.08	36	616717	5367889	616743	5367893
	URC-2	Upper Rainy Creek site	930	46	1.48	68	616764	5367850	616788	5367875
	TP-TOE2	Downstream of Tailings Impoundment	885	72	1.69	122	616303	5366381	616269	5366337
	LRC-1	Lower Rainy Creek site	811	60	1.79	107	615999	5365806	615958	5365728
	LRC-2	Lower Rainy Creek site	805	45	1.52	68	615929	5365736	615871	5365706
	LRC-3	Lower Rainy Creek site	796	60	1.5	90	615620	5364720	615597	5364696
	LRC-5	Lower Rainy Creek site	719	60	1.81	109	615072	5364096	615022	5364055

Source: Parametrix (2010)
UTM = Universal Transverse Mercator

Table 4.1
Phase IV-B Overview of Data Collection Activities

Reach	Station ID	Surface Water Sampling[1]	Continuous Flow Monitoring	Percent Pools and Pool Classes[2]	Temperature Monitoring[3]
Upper Rainy Creek	URC-1A			X	X
	URC-2			X	X
Lower Rainy Creek	LRC-1			X	X
	LRC-2	X	X	X	X
	LRC-3			X	X
	LRC-5			X	X
	LRC-6	X	X		
Tailings Impoundment	TP	X			
	TP-TOE2			X	X
Carney Creek	CC-2	X	X		
Reference Stations	BTT-R1			X	X
	NSY-R1			X	X

[1]Weekly sampling for LA and water quality parameters (e.g. pH, dissolved oxygen) beginnning in mid-April (prior to the onset of rising stream flows) through the end of spring high-flow. Biweekly sampling until fall (end of September).

[2]Once during late summer (mid-September).
[3]Early summer (mid-June) through late summer (end of September).

Table 6.1
Phase IV-B Laboratory Quality Control Samples for Asbestos Analyses

TEM Analyses of Surface Water

Sample Type	QC Frequency Requirement	Number Specified	Notes
Field Samples	--	*140*	[a]
Anlytical Laboratory QC Samples			
Laboratory Blank	4% (OU3 project and medium-specific)	6	[b]
Recount Same	1% (OU3 project and medium-specific)	1	
Recount Different	2.5% (OU3 project and medium-specific)	4	
Verified Analysis	1% (OU3 project and medium-specific)	1	
Repreparation	1% (OU3 project and medium-specific)	1	
Interlab	0.5% (OU3 project and medium-specific)	1	[c]

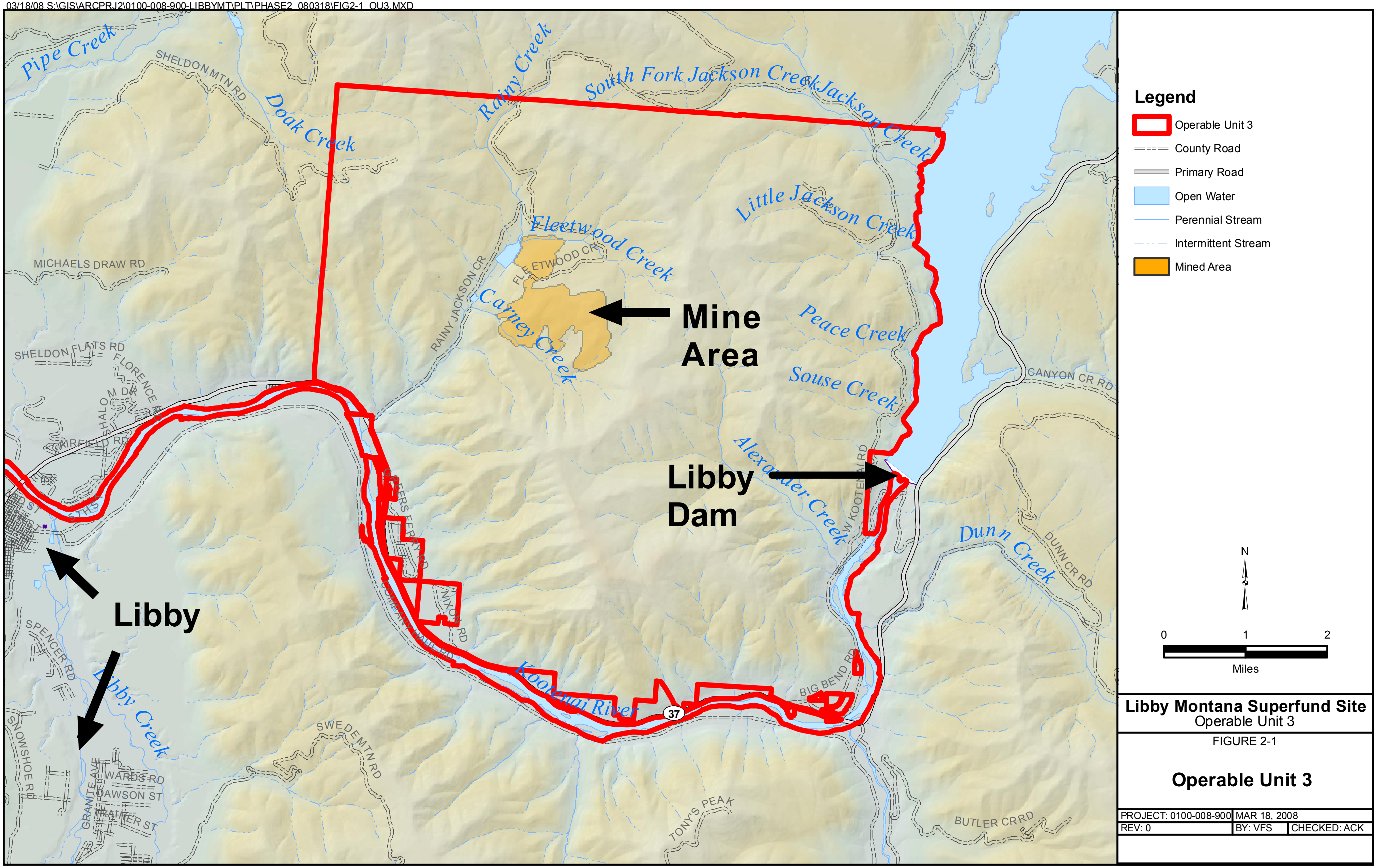
[a] Assuming 9 weekly sampling events and 7 biweekly events at 4 locations with 2 samples per location (bulk water and syringe filters); plus field QC samples.

[b] Approximately one per preparation batch

[c] To be selected post-analysis by EPA

This page intentionally left blank to facilitate double-sided printing.

03/18/08 S:\GIS\ARCPRJ2\0100-008-900-LIBBYMT\PLT\PHASE2_080318\FIG2-1_OU3.MXD



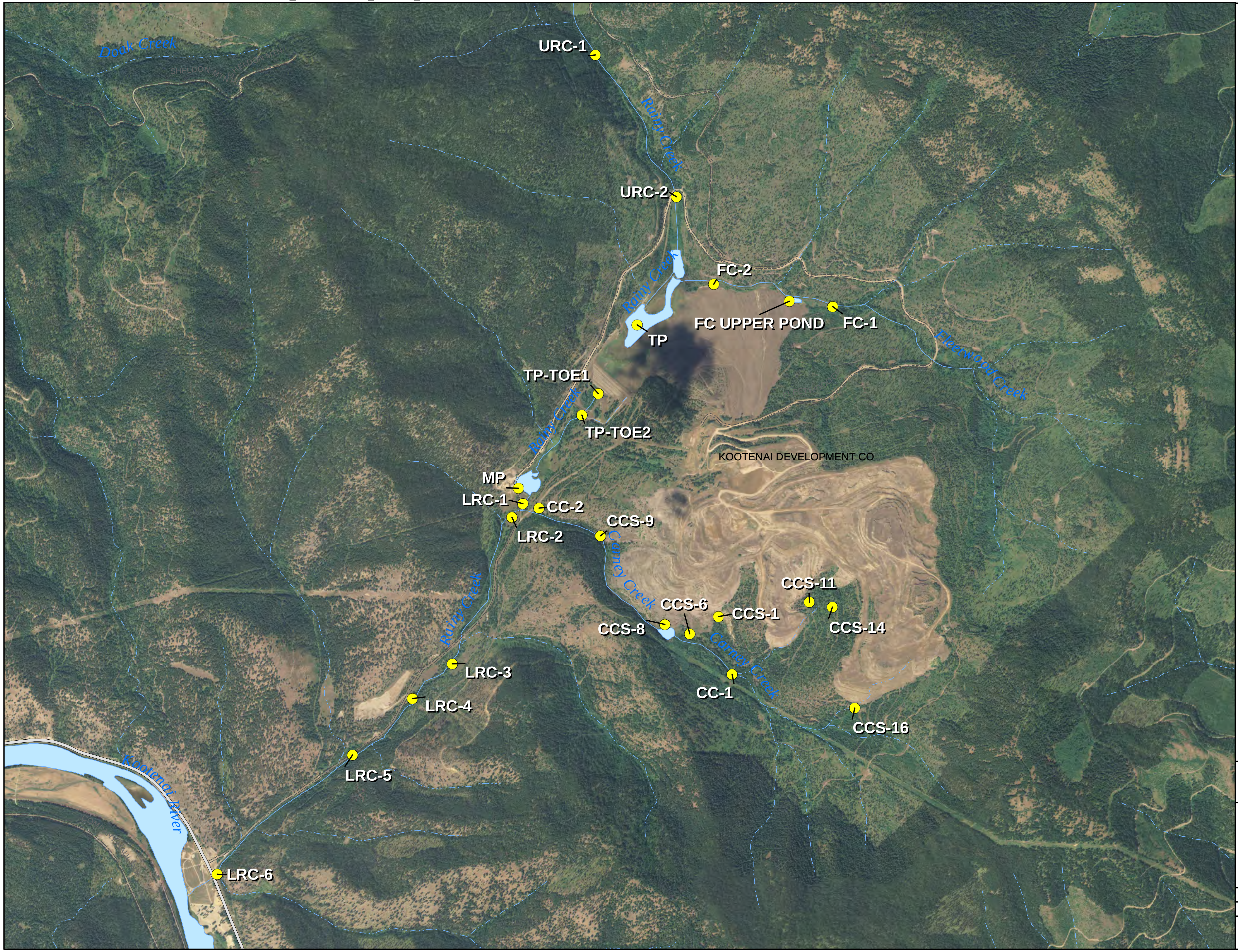
Libby Montana Superfund Site
Operable Unit 3

FIGURE 2-1

Operable Unit 3

PROJECT: 0100-008-900	MAR 18, 2008
REV: 0	BY: VFS CHECKED: ACK

S:\GIS\ARCPRJ2\0100-008-900-LIBBYMT\PLT\PHASEIVB_110224\FIG2-2_PHASEI_SAMPLOCS.MXD



Legend

- Surface Water Sampling Location
- County Road
- Primary Road
- Open Water
- Perennial Stream
- Intermittent Stream

N

0 2,000 4,000

Feet

LIBBY MONTANA SUPERFUND SITE
OPERABLE UNIT 3

FIGURE 2-2

PHASE I
SAMPLING LOCATIONS

PRJ: 0100-008-900	DATE: FEB. 24, 2011
REV: 0	BY: VFS FOR: ACK

NEWFIELDS

S:\GIS\ARCPRJ2\0100-008-900-LIBBYMT\PLT\PHASEIVB_110224\FIG2-3_PHASEII_SAMPLOCS.MXD

Legend

- Surface Water Sampling Location
- County Road
- Primary Road
- Open Water
- Perennial Stream
- Intermittent Stream

N

0 2,000 4,000

Feet

LIBBY MONTANA SUPERFUND SITE

OPERABLE UNIT 3

FIGURE 2-3

PHASE II
SAMPLING LOCATIONS

PROJECT: 0100-008-900	DATE: FEB. 24, 2011	
REV: 0	BY: CRL	CHECKED: ACK

NEWFIELDS

S:\GIS\ARCPRJ2\0100-008-900-LIBBYMT\PLT\PHASEIVB_110224\FIG2-4_PHASEII_AQUATICREFLOCS.MXD

Legend

Aquatic Reference Location

N

0 2 4

Miles

LIBBY MONTANA SUPERFUND SITE

OPERABLE UNIT 3

FIGURE 2-4

PHASE II
REFERENCE LOCATIONS

PRJ: 0100-008-900	DATE: FEB. 24, 2011
REV: 0	BY: CRL FOR: NR

NEWFIELDS